

## CLAIMS

What is claimed as new and desired to be protected by Letters Patent of the United States is:

1. An apparatus for manufacturing a semiconductor device, comprising:

a substrate holding unit for holding a semiconductor wafer substrate, wherein said semiconductor wafer substrate is provided with at least one electrode formed on a first surface thereof;

a discharging mechanism for discharging droplets of raw sealant resin contained in a resin container unit through at least one discharging nozzle onto said first surface of said semiconductor wafer substrate held on said substrate holding unit;

a drive mechanism for displacing at least one of said semiconductor wafer substrate and said discharging nozzle; and

a control unit for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said semiconductor wafer substrate except at least a portion of said electrode.

2. The apparatus for manufacturing a semiconductor device according to claim 1, wherein said electrode formed on said first surface of said semiconductor wafer substrate is a protruded-shaped electrode, and wherein said control unit is adapted to control said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface except a tip portion of said protruded-shaped electrode.

3. The apparatus for manufacturing a semiconductor device according to claim 1, wherein said discharging mechanism is provided with a plurality of discharging nozzles.

4. The apparatus for manufacturing a semiconductor device according to claim 1, wherein said substrate holding unit is provided with a substrate temperature control mechanism for controlling a temperature of at least said semiconductor wafer substrate.

5. The apparatus for manufacturing a semiconductor device according to claim 1, further comprising at least two kinds of discharging mechanisms, each being capable of discharging respective different amounts of raw sealant resin.

6. The apparatus for manufacturing a semiconductor device according to claim 1, further comprising a heater for heating said raw sealant resin contained in said resin container unit.

7. The apparatus for manufacturing a semiconductor device according to claim 1, wherein said control unit controls said discharging mechanism and said drive mechanism such that said raw sealant resin is not attached to at least a portion of dicing lines of said semiconductor wafer substrate.

8. The apparatus for manufacturing a semiconductor device according to claim 1, wherein said control unit is adapted to control said discharging mechanism and said drive mechanism such that said raw sealant resin is not attached to dicing lines of said semiconductor wafer substrate and forms a layer with edges of a rounded shape in a vicinity of intersecting points of said dicing lines.

9. The apparatus for manufacturing a semiconductor device according to claim 5, wherein said control unit controls said discharging

mechanism and said drive mechanism such that a first discharging mechanism of said at least two kinds of discharging mechanisms is capable of discharging droplets of raw sealant resin of an amount smaller than other discharging mechanisms used for discharging said raw sealant resin for an area in a vicinity of said electrode.

10. The apparatus for manufacturing a semiconductor device according to claim 6, wherein said control unit controls said discharging mechanism and said drive mechanism such that said raw sealant resin is not attached to at least a portion of dicing lines of said semiconductor wafer substrate.

11. The apparatus for manufacturing a semiconductor device according to claim 6, wherein said control unit controls said discharging mechanism and said drive mechanism such that said raw sealant resin is not attached to dicing lines of said semiconductor wafer substrate and forms a layer with edges of a rounded shape in vicinity of intersecting points of said dicing lines.

12. A method for manufacturing a semiconductor device, comprising:

resin sealing a semiconductor wafer substrate, said semiconductor wafer substrate provided with at least one electrode formed on a first surface thereof and said resin sealing including at least one of:

scanning a discharging nozzle for discharging droplets of raw sealant resin while suitably discharging said droplets;

forming a layer of said raw sealant resin on a first surface of said semiconductor wafer substrate such that a portion of said electrode is excepted from said layer; and

forming a sealant resin layer by hardening said layer of raw resin sealant.

13. The method for manufacturing a semiconductor device according to claim 12, wherein said electrode formed on said first surface of said semiconductor wafer substrate is a protruded-shaped electrode, and wherein said step of forming said layer includes forming except a tip portion of said protruded-shaped electrode.

14. The method for manufacturing a semiconductor device according to claim 12, wherein said step of forming said layer of raw sealant resin includes discharging droplets of raw sealant resin of an amount smaller for an area in a vicinity of said electrode than other portions of said semiconductor wafer substrate.

15. The method for manufacturing a semiconductor device according to claim 12, wherein said step of forming said layer of raw sealant resin includes forming said layer such that the layer does not attach to dicing lines of said semiconductor wafer substrate and such that said layer has a rounded shape in vicinity of intersecting points of said dicing lines.

16. The method for manufacturing a semiconductor device according to claim 12, wherein said step of forming said layer of raw sealant resin includes forming said layer by discharging droplets of raw sealant resin of an amount suitably differentiated depending on the location on said surface of said wafer substrate.

17. The method for manufacturing a semiconductor device according to claim 12, wherein said step of forming said layer of raw sealant resin includes:

forming said layer of raw sealant resin;

hardening said layer of raw sealant resin to form a first semi-hardened sealant resin layer;

repeating at least once a further step of forming a further raw sealant resin layer and hardening said further raw sealant resin layer to form a further semi-hardened sealant resin layer; and

hardening said first semi-hardened sealant resin layer and said further semi-hardened sealant resin layer altogether.

18. The method for manufacturing a semiconductor device according to claim 14, wherein said step of forming said layer of raw sealant resin includes forming said layer over said substrate with the exception of at least a portion of dicing lines of said semiconductor wafer substrate.

19. The method for manufacturing a semiconductor device according to claim 18, wherein said step of forming said layer of raw sealant resin includes forming said layer by discharging droplets of raw sealant resin of an amount suitably differentiated depending on the location on said surface of said wafer substrate.

20. The method for manufacturing a semiconductor device according to claim 18, wherein said step of forming said layer of raw sealant resin includes:

forming said layer of raw sealant resin,

hardening said layer of raw sealant resin to form a first semi-hardened sealant resin layer,

repeating at least once a further step of forming a further raw sealant resin layer and hardening said further raw sealant resin layer to form a further semi-hardened sealant resin layer, and

hardening said first semi-hardened sealant resin layer and said further semi-hardened sealant resin layer altogether.

21. A semiconductor device, comprising:

an electrode formed on a first surface of a semiconductor wafer substrate; and

a sealant resin layer formed on said first surface of said semiconductor wafer substrate such that a portion of said electrode is excepted from said layer and wherein edge portions of said sealant resin layer are formed with a rounded shape.

22. The semiconductor device according to claim 21, wherein:  
said electrode formed on said first surface of said semiconductor wafer substrate is a protruded-shaped electrode,  
and wherein said sealant resin layer is formed on said substrate with the exception of a tip portion of said protruded-shaped electrode.

23. An apparatus for manufacturing a semiconductor device,  
comprising:

substrate holding means for holding a semiconductor wafer substrate,  
wherein said substrate is provided with at least one electrode formed on a first surface thereof;

means for discharging droplets of raw sealant resin contained in a resin container unit through at least one discharging nozzle onto said first surface of said semiconductor wafer substrate held on said substrate holding unit;

drive means for displacing at least one of said semiconductor wafer substrate and said discharging nozzle; and

means for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said semiconductor wafer substrate with the exception of at least a portion of said electrode.

24. The apparatus for manufacturing a semiconductor device according to claim 23, wherein said means for controlling controls said means for discharging and said drive means such that said raw sealant resin is attached to said first surface with the exception of a tip portion of said protruded-shaped electrode.

25. The apparatus for manufacturing a semiconductor device according to claim 23, wherein said means for discharging is provided with a plurality of discharging nozzle means.

26. The apparatus for manufacturing a semiconductor device according to claim 23, wherein said substrate holding means is provided with a substrate temperature control means for controlling temperature of at least said semiconductor wafer substrate.

27. The apparatus for manufacturing a semiconductor device according to claim 23, further comprising:

at least two kinds of means for discharging, each said discharging means being capable of discharging raw sealant resin in an amount different from the other.

28. The apparatus for manufacturing a semiconductor device according to claim 23, further comprising:

means for heating said raw sealant resin contained in said resin container means.

29. The apparatus for manufacturing a semiconductor device according to claim 23, wherein said means for controlling controls said means for discharging and said drive means such that said raw sealant resin is not attached to at least a portion of dicing lines of said semiconductor wafer substrate.

30. The apparatus for manufacturing a semiconductor device according to claim 23, wherein said means for controlling controls said means for discharging and said drive means such that said raw sealant resin is not attached to dicing lines of said semiconductor wafer substrate and forms a layer with edges of a rounded shape in vicinity of intersecting points of said dicing lines.

31. The apparatus for manufacturing a semiconductor device according to claim 23, wherein said means for controlling controls said discharging mechanism and said drive mechanism such that a first means for discharging, of at least two kinds of means for discharging, is capable of discharging droplets of raw sealant resin of an amount smaller than other means for discharging and said first means for discharging is used for discharging said raw sealant resin for an area in vicinity of said electrode.

32. The apparatus for manufacturing a semiconductor device according to claim 28, wherein said means for controlling controls said means for discharging and said drive means such that said raw sealant resin is not attached to at least a portion of dicing lines.

33. The apparatus for manufacturing a semiconductor device according to claim 28, wherein said means for controlling controls said means for discharging and said drive means such that said raw sealant resin is not attached to said dicing lines and forms a layer with edges of a rounded shape in vicinity of intersecting points of said dicing lines.

34. A semiconductor device manufacturing apparatus, comprising:  
a semiconductor wafer substrate, said semiconductor wafer substrate having at least one electrode on a first surface thereof, and wherein said semiconductor wafer substrate is held in a substrate holding unit;



at least one discharging head for discharging raw sealant resin on said semiconductor wafer substrate and having at least one discharging nozzle;

a resin container unit connected to said discharging head and containing raw sealant resin;

a drive mechanism for displacing at least one of said semiconductor wafer substrate and said discharging head; and

a control unit for controlling said discharging head and said drive mechanism.

35. The apparatus according to claim 34 wherein said at least one electrode has a protruded-shape.

36. The apparatus according to claim 35 wherein said control unit controls said discharging head and said drive mechanism such that said first surface of the semiconductor wafer substrate is covered by said raw sealant resin except for a tip portion of said protruded-shaped electrode.

37. The apparatus according to claim 34 wherein said discharging head comprises a plurality of discharging nozzles.

38. The apparatus according to claim 34 further comprising a temperature control mechanism for controlling a temperature of at least said semiconductor wafer substrate.

39. The apparatus according to claim 34 wherein said discharging mechanism further comprises at least two kinds of discharging mechanisms, each being capable of discharging respective different amounts of raw sealant resin.

40. The apparatus according to claim 34 wherein said resin container unit further comprises a heater for heating said raw sealant resin contained in said resin container unit.